Homework1 王凯俊 520021910282

1.

We assume that t is the time we use before the enhancement, and t_1 is the time the part which will be enhanced uses.

So we can know the rest part time is $t-t_1$.

The enhancement improves some mode of execution by a factor of 3.Thus we can know that the part could use $\frac{t}{3}$ as the processing time.

And then we can get a equation: $\frac{t_1}{3}=t-t_1$

So we can get the $t_1 = \frac{3}{4}t$,and we can solve the a&b questions.

(a) Before time: t

After time: $\frac{t}{2}$ We have the speedup 2×.

(b) 75%.

2.

(a)There are no penalty to any other instructions, so we can use Amdahl' s law directly.

So we get $speedup_{overall}=\frac{1}{0.7+\frac{0.3}{3}}=1.25\times$

(b)We have data cache processing slowed down, we use the Amdahl' s law in the special forms.

So we get $speedup_{overall}=\frac{1}{\frac{0.1}{0.5}+0.6+\frac{0.3}{3}}\approx 1.11\times$

(c)The percentage of execution time spent on floating-point operations is $\frac{0.1}{0.9}\approx 11\%$

The percentage of execution time spent on data cache accessed is $\frac{0.2}{0.9} \approx 22\%$

3.

(a) $speedup = \frac{1}{0.5 + \frac{0.5}{2}} \approx 1.33\times$

(b) $speedup = \frac{1}{0.2 + \frac{0.8}{2}} \approx 1.67\times$

(c) $speedup = \frac{1}{0.6 \times \frac{0.5}{2} + 0.6 \times 0.5 + 0.4} \approx 1.18\times$

(d) $speedup = \frac{1}{0.6 + 0.4 \times 0.2 + 0.4 \times \frac{0.8}{2}} \approx 1.19\times$

4.

(a) $speedup = \frac{1}{0.2 + \frac{0.8}{N}} = \frac{N}{0.2N + 0.8}$

(b) $speedup = \frac{1}{0.2 + 0.08 + \frac{0.8}{8}} \approx 2.63\times$

(c) $speedup = \frac{1}{0.2 + \frac{0.8}{8} + 0.03} \approx 3.03$

(d) $speedup = \frac{1}{0.2 + \frac{0.8}{N} + 0.01 \times \log_2 N}$

(e) $speedup = \frac{1}{1 - P\% + \frac{P\%}{N} + 0.01 \times \log_2 N}$

And we can find that when $N = P \ln 2$,We can have the highest speedup.